CLAIMS:

1. A process of producing a transformed gymnosperm plant or plant precursor having a genome containing at least one expressible transgene that results in modification of lignin composition in the gymnosperm plant compared to an average lignin composition of untransformed wild type plants of the same gymnosperm species, which process comprises:

providing a vector containing at least one expressible transgene that results in modification of the lignin composition in the gymnosperm plant;

introducing said vector into cells of a gymnosperm to produce transformed cells;

regenerating transformed gymnosperm callus or shoots from the transformed cells;

maturing embryos from the transformed callus or shoots; and

generating transformed plant embryos, seeds, seedlings or plants from the matured embryos or shoots.

2. A process according to claim 1, characterized in that said vector is provided with said at least one expressible transgene that encodes at least one enzyme affecting the phenylpropanoid pathway leading to the synthesis of lignin.

3. A process according to claim 1, characterized in that said vector is provided with said expressible transgene that encodes at least one enzyme enabling the production of sinapyl alcohol or other residues with a side group at the C-5 position of a monolignol ring during the biosynthesis of lignin.

4. A process according to claim 1, characterized in that said vector is provided with said at least one expressible transgene that encodes at least one enzyme enabling the production of lignin containing syringyl residues or other residues with a side group at the C-5 position of a monolignol ring.

5. A process according to claim 4, characterized in that said vector is provided with an expressible transgene encoding ferulate 5-hydroxylase, or a transgene that has substantially equivalent function to said ferulate 5-hydroxylase gene, either alone or in conjunction with other genes involved in lignin biosynthesis.

6. A process according to claim 5, characterized in that one of the said substantially homologous gene has at least 50% homology with said ferulate 5-hydroxylase gene.

7. A process according to claim 5, characterized in that said substantially homologous gene has at least 75% homology with said ferulate 5-hydroxylase gene.

8. A process according to any preceding claim, characterized in that said gymnosperm plant is from the order coniferales.

9. A process according to any preceding claim, characterized in that said gymnosperm plant is from the species *Picea*.

10. A process according to claim 9, characterized in that said plant is *Picea glauca, Picea sitchesis,* or *Picea engelmanii*.

11. A process according to any one of claims 1 to 8, characterized in that said gymnosperm plant is from the species *Pinus*.

12. A process according to claim 11, characterized in that said gymnosperm plant is *Pinus taeda* or *Pinus radiata*.

13. A process according to claim 5, characterized in that said ferulate 5-hydroxylase gene is operably linked with at least one regulatory sequence.

14. A process according to claim 13, characterized in that said regulatory sequence is cauliflower mosaic virus 35S promoter, a promoter for a phenylalanine ammonia lyase gene, a promoter for a p-coumaryl CoA ligase gene, a promoter for cinnamate 4-hydroxylase, or another plant promoter capable of controlling expression of plant genes.

15. A transformed gymnosperm plant or plant precursor having a genome containing at least one expressible transgene that results in modification of lignin composition in the gymnosperm plant compared to an average lignin composition of untransformed wild type plants of the same gymnosperm species.

16. A gymnosperm plant or plant precursor according to claim 15, characterized in that said plant has a genome containing at least one expressible transgene that encodes at least one enzyme enabling the production of sinapyl alcohol, or other residue with a side group at the C-5 position of a monolignol ring, during the biosynthesis of lignin.

17. A gymnosperm plant or precursor according to claim 15, characterized in that the plant or plant precursor has a genome containing an

expressible transgene that results in a lignin composition containing syringyl residues, or other residue with a side group at the C-5 position of a monolignol ring.

18. A gymnosperm plant or precursor according to claim 15, characterized in that said at least one expressible transgene is a gene encoding ferulate 5-hydroxylase, or a transgene that has substantially equivalent function to said ferulate 5-hydroxylase gene, either alone or in conjunction with other genes involved in lignin biosynthesis.

19. A gymnosperm plant or precursor according to claim 18, characterized in that said substantially homologous gene has at least 50% homology with said ferulate 5-hydroxylase gene.

20. A gymnosperm plant or precursor according to claim 18, characterized in that said substantially homologous gene has at least 75% homology with said ferulate 5-hydroxylase gene.

21. A gymnosperm plant or precursor according to claim 15, characterized in that said gymnosperm plant is from the order coniferales.

22. A gymnosperm plant or precursor according to claim 15, characterized in that said gymnosperm plant is from the species *Picea*.

23. A gymnosperm plant or precursor according to claim 22, characterized in that said plant is *Picea glauca, Picea sitchesis*, or *Picea engelmanii*.

24. A gymnosperm plant or precursor according to claim 15, characterized in that said gymnosperm plant is from the species *Pinus*.

25. A gymnosperm plant or precursor according to claim 24, characterized in that said gymnosperm plant is *Pinus taeda* or *Pinus radiata*.

26. A gymnosperm plant or precursor according to claim 18, characterized in that said ferulate 5-hydroxylase gene is operably linked with at least one regulatory sequence.

27. A gymnosperm plant or precursor according to claim 26, characterized in that said regulatory sequence is a cauliflower mosaic virus 35S promoter, a promoter for a phenylalanine ammonia lyase gene, a promoter for a p-coumaryl CoA ligase gene, a promoter for cinnamate 4-hydroxylase, or any other plant promoter capable of controlling expression of plant genes.

28. A biomass derived from a genetically transformed gymnosperm plant, said biomass containing lignin having syringyl residues, or other residue with a side group at the C-5 position of a monolignol ring, and said transformed plant having an untransformed natural wild-type plant whose lignin contains no syringyl residues, or corresponding other residues with a side group at the C-5 position of a monolignol ring.

29. A biomass according to claim 28, resulting from growing and harvesting a genetically transformed plant or plant precursor as defined in any one of claims 15 to 27.

30. A method of producing a cellulose-containing pulp useful for papermaking and the like, which comprises finely dividing a lignin-containing biomass derived from a gymnosperm plant to produce pulped mass containing lignin, and removing at least some of said lignin from said pulped mass, characterized in that said gymnosperm

plant is a genetically transformed plant producing lignin containing syringyl residues or other residues with a side group at the C-5 position of a monolignol ring.

31. A process of producing a transformed gymnosperm plant or plant precursor having a genome containing at least one expressible transgene that results in production of at least one residue of a lignin biosynthetic pathway having a hydroxy group at the C-5 position of a monolignol ring, which process comprises:

providing a vector containing at least one expressible transgene that results in production of at least one residue having a hydroxy group at the C-5 position of a monolignol ring;

introducing said vector into cells of a gymnosperm to produce transformed cells;

regenerating transformed gymnosperm callus or shoots from the transformed cells;

maturing embryos from the transformed callus or shoots; and

generating transformed plant embryos, seeds, seedlings or plants from the matured embryos or shoots.

32. A process of producing a transformed gymnosperm plant or plant precursor having a genome containing at least one expressible transgene encoding an enzyme enabling hydroxylation at the C-5 position of a monolignol ring of at least one residue in a lignin biosynthetic pathway, which process comprises:
providing a vector containing at least one expressible transgene encoding an enzyme enabling hydroxylation at the C-5 position of a monolignol ring of at least one residue;

introducing said vector into cells of a gymnosperm to produce transformed cells;

regenerating transformed gymnosperm callus or shoots from the transformed cells;

maturing embryos from the transformed callus or shoots; and

generating transformed plant embryos, seeds, seedlings or plants from the matured embryos or shoots.

33. The process of claim 32, wherein the enzyme is selected from the group comprising ferulate-5-hydroxylase and homologs thereof.

34. A process of producing a transformed gymnosperm plant or plant precursor having a genome containing at least one expressible transgene that results in hydroxylation of at least one residue of a lignin biosynthetic pathway at the C-5 position of a monolignol ring, which process comprises:

providing a vector containing at least one expressible transgene that results in hydroxylation of at least one residue at the C-5 position of a monolignol ring;

introducing said vector into cells of a gymnosperm to produce transformed cells;

regenerating transformed gymnosperm callus or shoots from the transformed cells;

maturing embryos from the transformed callus or shoots; and

generating transformed plant embryos, seeds, seedlings or plants from the matured embryos or shoots.

35. A transformed gymnosperm plant or plant precursor having a genome containing at least one expressible transgene that results in hydroxylation of at least one residue of a lignin biosynthetic pathway at the C-5 position of a monolignol ring.

36. A transformed gymnosperm plant or plant precursor having a genome containing at least one expressible transgene that encodes at least one enzyme enabling the production of a residue of a lignin biosynthetic pathway with a side group at the C-5 position of a monolignol ring, during the biosynthesis of lignin.